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A METHOD AND DEVICE FOR FORMING A GAP OF AN LIQUID CRYSTAL  
DISPLAY PANEL

15

[Abstract]

**PROBLEM TO BE SOLVED:** To provide a gap forming method and device for a liquid crystal display panel having gap accuracy of a uniform finish.

**SOLUTION:** A pair of glass substrates 1 opposed to each other across a panel seal 10 consisting of a UV curing resin are placed on a surface plate 2 and a chamber 8 is installed onto the glass substrates 1. An in-chamber pressurizing section 4 which is a hermetic space is formed across a chamber seal 9 within the chamber 8 and this in-chamber pressurizing section 4 is filled with high-pressure air, by which the glass substrates 1 are evenly thrust

and the gap of the panel seal 10 is formed. The panel seal 10 is irradiated in this state with UV rays 6 from a UV lamp 5, by which the panel seal is cured and the gap of the panel seal 10 of the liquid crystal panel is uniformly finished.

**[Claim(s)]**

**[Claim 1]** A method for forming a gap of a liquid crystal display panel, which is characterized in that a pair of glass substrates face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure of air from one side, and a hardening process is performed by illuminating ultraviolet rays into a panel seal having said ultraviolet ray hardening property under the state.

**[Claim 2]** The method for forming a gap of a liquid crystal display panel as set forth in the claim 1, a buffer member is arranged between the predetermined plate and the pair of glass substrates.

**[Claim 3]** A device for forming a gap of a liquid crystal display panel, which is characterized in that it is composed of a predetermined plate for mounting a pair of glass substrates with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a chamber having a pressure means using air and arranged on the pair of glass substrates, and an ultraviolet ray illumination means for illuminating and hardening a panel

seal having an ultraviolet ray hardening property, wherein said pressure means of the chamber applies pressure to said pair of glass substrates, thereby a predetermined gap is formed between said pair of glass substrates, and a hardening process is performed by illuminating ultraviolet rays into a  
5 panel seal having said ultraviolet ray hardening property under the state.

[Claim 4] The method for forming a gap of a liquid crystal display panel set forth in the claim 3, a buffer member is arranged between the predetermined plate and the pair of glass substrates.

**[Title of the Invention]**

**A METHOD AND DEVICE FOR FORMING A GAP OF AN LIQUID CRYSTAL  
DISPLAY PANEL**

**[Detailed Description of the Invention]**

5 **[Field of the Invention]**

The present invention is related to a method and device for forming a gap of an liquid crystal display panel, wherein a predetermined gap is formed between said pair of glass substrates, and a panel seal is hardened.

**[Description of the Prior Art]**

10 In the past, as a method for forming a gap, a gap of a seal is formed by applying an pressure corresponding to a pressure difference between a vacuum and atmosphere. Then, a pair of opposing glass substrates are put into a transparent envelope and vacuum-packed with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween.

15 Below, a conventional method for forming a gap will be explained with referring to FIG. 3 and FIG. 4. As is shown in FIG. 4, a pair of glass substrates 1 faces each other with a panel seal 10 being sandwiched therebetween. As is shown in FIG. 3, they are put into an envelope 12 of a vacuum pack and the

inside is made to be vacuum state. Therefore, a seal is formed on a pair of glass substrates by applying an pressure corresponding to a pressure difference between a vacuum and atmosphere. Under the state, the gap is mounted on the predetermined plate 2, and a panel seal having said ultraviolet ray hardening property is hardened by illuminating an ultraviolet ray by UV lamp 5.

**[Problem(s) to be Solved by the Invention]**

But, according to the conventional method, when forming a gap between a pair of glass substrates 1 by a panel seal 10, since a pressure amount required for forming a gap is calculated based upon a pressure difference between a vacuum and atmosphere, there was a problem that it is difficult to control vacuum level of a vacuum pack or fine pressure change under the vacuum-pack state, and to form an uniform gap.

The object of the present invention is to provide a method and device for forming a gap of an liquid crystal display panel which can form an uniform gap.

**[Means for Solving the Problem]**

In order to accomplish above-mentioned objects, the present invention provides a method for forming a gap of an liquid crystal display

panel, which is characterized in that a pair of glass substrates face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure of the air from one side, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state.

Further, the present invention provides a device for forming a gap of an liquid crystal display panel, which is characterized in that it is composed of a predetermined plate for mounting a pair of glass substrates with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a chamber having a pressure means using an air and arranged on the pair of glass substrates, and an ultraviolet ray illumination means for illuminating and hardening a panel seal having an ultraviolet ray hardening property, wherein said pressure means of the chamber pressures said pair of glass substrates, thereby a predetermined gap is formed between said pair of glass substrates, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state.

According to a method and device for forming a gap of an liquid crystal display panel, an uniform pressure is applied on the glass substrate by pressing an upper side of a pair of glass substrates mounted on a predetermined plate by a pressure of a pressure means using an air, and thus  
5 a predetermined gap is formed between a pair of glass substrates. Under the state, an uniform gap can be formed by illuminating a panel seal with ultraviolet rays, and hardening.

**[Embodiment of the Invention]**

Below, the embodiment of the present invention will be explained in  
10 detail with referring to the drawings.

**(First embodiment)**

FIG. 1 is a drawing of a method for forming a gap using a gap forming device of a LCD panel according to the first embodiment of the present invention. 1 is a pair of glass substrates, 2 is a predetermined plate, 3 is an  
15 UV mask, 4 is a pressure means of a chamber, 5 is an UV lamp, 6 is an ultraviolet ray, 7 is a Pyrex(a registered trademark), 8 is a chamber, 9 is a chamber seal, and 10 is a panel seal.

The operation of a gap forming device having above-mentioned structure will be explained. First of all, as is shown in FIG. 1, a pair of



opposing glass substrates 1 are mounted on the predetermined predetermined plate 2 with a panel seal 10 having an ultraviolet ray hardening property being sandwiched therebetween, and a chamber 8 is arranged on the pair of opposing glass substrates 1. A pressure means 4 which is a

5 tightly closed space is formed with a chamber seal 9 being sandwiched in the inner side of a chamber 8. The pair of opposing glass substrates 1 is pressed uniformly by filling an air into the pressure means 4 , thereby a panel seal is formed. Then, under the state, an uniform gap of a panel seal 10 of an liquid crystal panel can be formed by illuminating ultraviolet rays with an UV lamp 5,

10 and hardening a panel seal 10 having an ultraviolet ray hardening property.

At this time, standard brightness of the predetermined plate requires a precision corresponding to below 1/10,000mm.

(Second embodiment)

FIG. 2 is a drawing of a method for forming a gap using a gap forming

15 device of a LCD panel according to the first embodiment of the present invention. Those parts which are denoted by same reference number of the FIG. 1 represent same parts, and ii is a buffer member.

The difference between the embodiment 1 and 2 is as follows. A buffer member 11 is arranged between a pair of opposing glass substrates 1, and

the predetermined plate 2. In this way, an uniform gap of a panel seal 10 can be formed without being affected by the intensity of standard brightness of the predetermined plate 2.

Further, in connection with the buffer member 11, a glass(the surface  
5 precision : below 1/10,000mm, a thickness : 1 -1.5mm) is used as a material having a high hardness. A rubber(a thickness : 0.5-1.0mm, a Teflon(a registered trademark), and a sheet(a thickness : 0.5 -1.0mm) are enumerated as the elastic materials.

#### [Effect of the Invention]

10 As described above, according to the present invention, a pair of glass substrates is formed such that they face each other with a panel seal having an ultraviolet ray hardening property being sandwiched therebetween, a predetermined plate is contacted to one side of a pair of glass substrates, a predetermined gap is formed between a pair of glass substrates by pressure  
15 of the air from one side, and a hardening process is performed by illuminating an ultraviolet ray into a panel seal having said ultraviolet ray hardening property under the state. Therefore, an uniform gap of LCD panel can be formed.

Further, an uniform gap of LCD panel can be obtained by arranging a

**buffer member between the predetermined plate and a glass substrate, with eliminating the influence of a standard precision of a predetermined plate.**

**[Description of Drawings]**

**FIG. 1 is a drawing showing a structure of a gap forming device of a LCD panel according to the first embodiment of the present invention.**

**FIG. 2 is a drawing showing a structure of a gap forming device of a LCD panel according to the second embodiment of the present invention.**

**FIG. 3 is a drawing showing a structure of a gap forming device of a LCD panel according to the prior art.**

**FIG. 4 is a drawing showing a structure of a panel seal on the glass substrate.**